

C



11 Publication number: **0 506 122 A3**

12 **EUROPEAN PATENT APPLICATION**

21 Application number: **92105378.1**

51 Int. Cl.<sup>5</sup>: **H01L 25/07, H01L 25/16, H01L 23/66**

22 Date of filing: **27.03.92**

30 Priority: **29.03.91 JP 66312/91**  
**29.03.91 JP 66315/91**

43 Date of publication of application:  
**30.09.92 Bulletin 92/40**

84 Designated Contracting States:  
**DE FR GB**

68 Date of deferred publication of the search report:  
**14.09.94 Bulletin 94/37**

71 Applicant: **MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD**  
**1006, Oaza Kadoma,**  
**Kadoma-shi**  
**Osaka 571 (JP)**

72 Inventor: **Ishikawa, Osamu**  
**8-1-9 Minami-Kamodai,**  
**Kamo-cho**  
**Souraku-gun, Kyoto 619-11 (JP)**  
 Inventor: **Ota, Yorito**

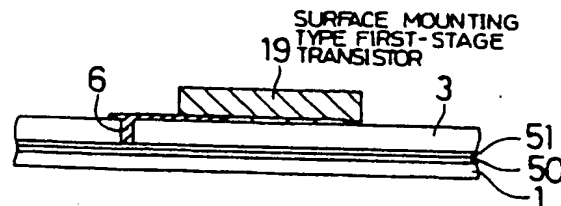
**1-6-4 Gakuen-Higashimachi,**  
**Nishi-ku**  
**Kobe-shi, Hyogo 651-21 (JP)**  
 Inventor: **Maeda, Masahiro**  
**1-4-40-358 Nonaka-minami,**  
**Yodogawa-ku**  
**Osaka 532 (JP)**  
 Inventor: **Azuma, Chinatsu**  
**44-19 Kamikashiwano-cho,**  
**Murasakino**  
**Kita-ku, Kyoto 603 (JP)**  
 Inventor: **Yanagihara, Manabu**  
**5-15-A-205 Niina**  
**Minoo-shi, Osaka 562 (JP)**  
 Inventor: **Nishii, Katsunori**  
**5-4-1-102 Kourigaoka**  
**Hirakata-shi, Osaka 573 (JP)**

74 Representative: **Patentanwälte Grünecker,**  
**Kinkeldey, Stockmair & Partner**  
**Maximilianstrasse 58**  
**D-80538 München (DE)**

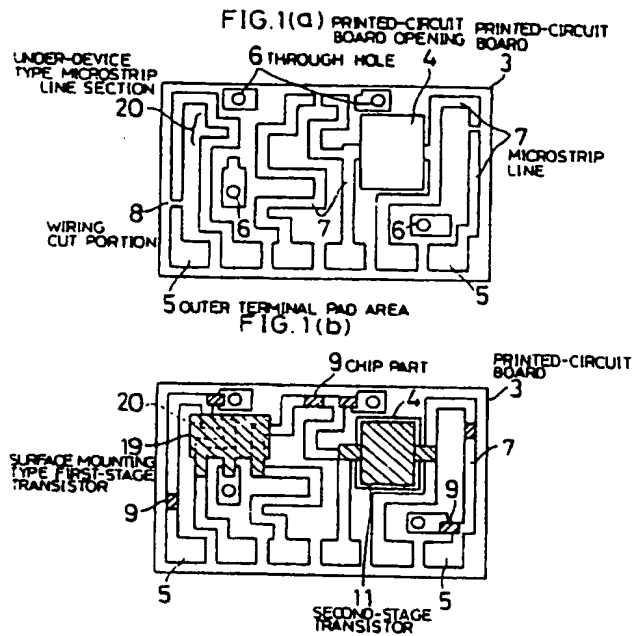
54 **Power module.**

57 In order to accomplish the miniaturization of a power module, the invention proposes such one which comprises a high frequency multi-stage power amplifier circuit which includes a chip part and a power amplifier semiconductor each mounted on a printed-circuit board that is firmly fixed to a heat radiation plate by fixing means like soldering, wherein there is arranged a microstrip line in an area of the printed-circuit board under a surface mounting type package in which said power amplifier semiconductor is mounted.

FIG. 1(c)



EP 0 506 122 A3





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 92 10 5378

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cls.)
A	GB-A-2 219 435 (BURR-BROWN CORP.) * page 1, line 3 - line 17 * * page 4, line 12 - page 5, line 19 * * page 7, line 1 - page 11, line 22; figures * ---	1, 11, 12	H01L25/07 H01L25/16 H01L23/66
A	EP-A-0 117 434 (MICROWAVE SEMICONDUCTOR CORP.) * page 2 * * page 5 - page 6 * * page 9 - page 13; figures * ---	1-12	
A	EP-A-0 221 399 (BROWN, BOVERI & CIE) * column 2, line 44 - column 5, line 18; figures * ---	1-7, 11-13	
X		8-10	
A	PATENT ABSTRACTS OF JAPAN vol. 005, no. 103 (E-64) (775) 3 July 1981 & JP-A-56 045 069 (NIPPON DENKI) 24 April 1981 * abstract * ---	1, 5, 12, 13	TECHNICAL FIELDS SEARCHED (Int.C1.5)  H01L
A	DE-A-39 34 224 (LICENTIA PATENT-VERWALTUNGS-GMBH) * the whole document * ---	1, 11, 12	
A	FR-A-2 529 013 (N.V. PHILIPS' GLOEILAMPENFABRIEKEN) * page 5, line 36 - page 8, line 20; figures 1-4 * ---	1, 11-13	
A	US-A-4 313 262 (N. S. BARNES ET AL) * column 2, line 22 - column 3, line 58; figures * ---	1, 5, 12	
-/--			
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 15 July 1994	Examiner Roussel, A
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document  T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons * : member of the same patent family, corresponding document			

EPO FORM 1501/92 (P4/C01)



European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 92 10 5378

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 5, no. 153 (E-076) 26 September 1981 & JP-A-56 086 518 (MATSUSHITA ELECTRIC INDUSTRIAL CO.) * abstract *	2-4	
A	EP-A-0 135 089 (IBM CORP.) * page 3, line 22 - page 5, line 7; figure 1 *	6,7	
A	US-A-3 958 075 (L. R. KAUFMAN) * column 2, line 4 - column 4, line 3; figures *	6,7	
A	ELECTRONIC DESIGN, vol.33, no.5, March 1985, HASBROUCK HEIGHTS, NEW JERSEY US pages 115 - 122 D. MILLER * the whole document *	6-10	
A	FR-A-2 554 275 (RTC LA RADIOTECHNIQUE-COMPELEC) * the whole document *	1-13	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
Place of search BERLIN		Date of completion of the search 15 July 1994	Examiner Roussel, A
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons * : member of the same patent family, corresponding document			

EPO FORM 150 (01.92) (POM/CH)



European Patent  
Office

EP 93 105 378.1

#### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

#### X LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent  
Office

EP 92105378 - B -

#### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1,11,12: Power module with wiring pattern formed on the backside of a circuit board.
2. Claims 2,3,4: Power module with higher harmonic resonance circuits comprising microstrip lines and capacitances.
3. Claim 5: Power module with resistor inserted between amplifier stages.
4. Claims 6,7: Power module with openings in the resist coating.
5. Claims 8,9,10: Power module with in common connected circuit parts.
6. Claim 13: Pattern of microstrip line.